MSPACE Knowledge Sharing and Future Planning Workshop: Belfast, Northern Ireland

Report
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Background

The Northern Ireland Workshop took place in Belfast on September 18, 2023, from 9:30 to 16:00. Dr Billy Hunter, the case lead, welcomed the workshop organisers and participants to the Agri-Food and Bioscience Institute, which was equipped to allow virtual participants via Microsoft Teams as well as in-person attendance. The workshop was comprised of 3 virtual and 19 in-person participants and joined by 3 virtual and 4 in-person MSPACE team members. Participants represented the 3 key MSPACE sectors (fishing, aquaculture, conservation), renewable energy, and marine planners.

Presentations took place in the morning and early afternoon after the lunch break (WPs 1-3). Presenters solicited feedback from the participants throughout the presentations which was readily given by participants. This feedback was gathered by each WP presenter, through a recording of the session, and through note taking by Pat Danahey Janin and Océane Marcone (on-line) during the presentations.

The morning presentations sought to accomplish the following:

- Present an overview of MSPACE, followed by the outcomes of WP1 - Climate smart marine planning, WP2 – Governance maps, values, and preferences for the region, WP3 – Economic input-output model applied to the maritime sector.
- Obtain feedback from the participants on the utility of the work, possible specialised reports geared towards regional preoccupations and priorities, additional data sources, and potential future representations of the governance maps. This feedback helps work towards the MSPACE project central goal (triple bottom line): advising policy makers regarding climate-smart, economically viable and socially acceptable marine planning strategies.

A worksheet exercise and interactive discussion took place in the afternoon over approximately 1 hour. Participants were asked to individually fill out a worksheet based upon their current professional role and respond to a list of characteristics to evaluate a climate smart marine spatial plan. The list of 15 characteristics presented were non exhaustive examples taken from the values and preferences survey administered between June 2022 and April 2023. Each participant was asked to respond to 5 questions and indicate 1) which criteria were considered important, 2) which criteria were considered less important, 3) what might be missing, 4) what might be removed and 5) any additional comments. An open discussion ensued to understand the participants' responses.

The afternoon workshop sought to accomplish the following:

- identify general criteria (concepts) that could help specify designated criteria (operational definitions) in subsequent scenario planning sessions.
- Work towards the MSPACE project central goal as described for the morning presentation session.

One key goal was to learn which criteria were most important to participants and why.

A pre- and post- survey was administered to assess the impact of the workshop.

Workshop Presentation Feedback

WP1 Feedback

Following the WP1 presentation on how the MSPACE project seeks to deliver a decision support system to enable climate-smart marine spatial planning with no-regrets decisions, participants were asked to give their feedback on the presentation and the interest of the information. Feedback came in the form of questions/answers and centered on renewable energy as a missing sector in the study, data deficiencies, mitigation efforts, the future prescriptive nature of plans, and bias towards certain stakeholders. The following paragraphs summarize the exchanges.

Renewable Energy Missing from Study

One key question centered on a missing sector in the study: *Why is Offshore Energy not mentioned and why are they not involved? Any plan that doesn't involve them won't succeed.* One participant active in economic development added that it was too late to include offshore energy in the study, but it was possible to move forward together. MSPACE PI Ana Queiros replied that ORSTED has been consulted and that the MSPACE project welcomes specific contacts in NI Crown Estate for example.

Downstream Effects on Marine and Fisheries Sector

One participant pointed to the concurrent Lough Neagh toxic blue green algae outbreak in Northern Ireland to demonstrate the downstream effects of inshore water areas on marine and fisheries sectors. The participant asked whether these or similar effects were incorporated in the mapping. Ana Queiros reponded that nutrient data does take into account effects coming from upstream loughs and rivers.

Features Chosen to Analyse

Several questions were raised around the features chosen to analyse: *How did the MSPACE Team choose the features to analyse on the sensitivity maps? Were they determined at the food web or seabed level?* Ana Queiros responded that benthic and pelagic habitat, megafauna, climate services of carbon sequestration on the seafloor, and the environmental system itself – the ecosystem, species distribution of prey for foraging, landings by value species on UK level were all considered. They have looked at key gaps in data and they may have gaps in crustacea in NI.

Data Deficiency

Data deficiency was a concern of several participants, who asked: *Given that a lot of data is deficient for NI, how can the model work?* Ana responded that not all data for NI is deficient, yet unfortunately the presentation didn't show all the validated data. She mentioned that some UK-wide data is deficient, such as ocean oxygen levels. The same question was raised for information about the Republic of Ireland due to transboundary issues. *Is it possible to identify whether data for the Republic of Ireland is available and could it be used?* Ana responded that the project sought to validate data through observation for the UK. Modelling analysis is being done for Ireland in the Horizon 2020 Group Fair Seas within the Irish EEZ for the conservation sector.

One participant from the fishing industry asked whether information gaps would be worth sharing with the fishing industry. Five participants expressed interested in this information for fisheries and aquaculture. Ana Queiros suggested she follow up offline to share gaps. These

questions presented the opportunity for Ana to acknowledge that data gaps are real, for example for carbon sequestration data on the sea floor and for emissions. Two participants added that there is concern over the data that was used as it has gaps in carbon stocks due to an issue of time. Billy Hunter explained that modelling of this project was pushed ahead with other projects of mapping with CEFAS, which raises the question of how we integrate future data into these data sets. Ana requested participants share data sets if they know they exist.

Mitigation

Several questions were raised around mitigation: *What happens to the early warning system in case of the need of mitigation? What mitigation measures are proposed?* Ana Queiros took the opportunity to clarify the role of MSPACE, which is to deliver information and advice on where key gains can be made in planning areas that are climate resilient and also draw attention to areas where mitigation needs to be put in place as soon as possible. However, it is not up to the research sector to put that mitigation in place. Current sectoral mitigation measurements consider 3 aspects: the economic structure, for example which subsectors depend on this resource; the groups involved in the planning decision; and how are they affected by the plans.

Future Prescriptive Nature of Plans

More than one participant mentioned that plans are not spatial and have not had the ability to make recommendations to prioritise sectors. Ana Queiros suggested that plans will be more prescriptive in the future since planners can use climate change information to see where species are moving and assess changes in catch composition over time. Planners will consider that to have a climate resilient fishing industry it makes sense to not allow wind farms or dredging in some areas. Such areas will present a high value for conservation.

Currently, when the plan is used at the licensing stage, there has not been a link between the plan, policies, and objectives. The intention with MSPACE is to be more adaptive in planning. In the past these efforts have been broadly aspirational and now the MSPACE project is trying to help make that connection. One participant responded that when the only thing that's certain is change, then less prescriptive is better. In this participant's opinion we must be mindful about how the world works and remain flexible.

Bias towards Interest Areas of Partners

One participant in the fishing industry expressed concern about bias against his sector, referring to 2 "alarm bells" when he hears that MCCIP is responsible for mitigation of marine climate change impacts. He acknowledged his own bias toward fishing and asked: *What is the chance that partners will be free of bias?* He pointed out various places throughout the MPACE presentations that revealed bias, and commented that it is not a win-win situation when fishing loses out. His stated approach is that all stakeholders should be involved.

Ana explained that the MCCIP Partnership has links with people in government agencies of all different functions, researchers, and individuals with diverse expertise, some in CEFAS for example. These partners don't fall into one specific camp for policy design –they are logical project partners. There remain important questions around how information is passed on to policymakers. Maybe a sectorial report for policy making would be better. She went on to explain that the report does not have biases and the project has no stake in any industries. There is evidence that resources are changing over the long-term, with various species in

decline, and evidence of multiple climate change sensitivities; however, the research did not include modelling for species that might be important for the sector in the future.

Warning for Recommendations

A participant noted that the MSPACE information was helpful, though it would make the fishing industry nervous, especially if made based on assumptions applied UK-wide. Spatial maps are based on coarse data and don't give a good idea of where the fishing is happening. Any recommendations will need to be site specific and include the type of gear. Ana responded that the economic analysis would account for this sort of information since the data is disaggregated showing which sub-sectors of the fishing industry are present. The report's final recommendations section will include that information. She asked the participants to help make sure the scenarios are correct, emphasising that recommendations must consider area specifics.

Regional Maps of Interest

One participant expressed strong interest in the regional maps and asked if it was possible to share with stakeholders. Ana specified that the shapefiles are available and will be downloadable on Oct 3, 2023. She suggested reading the report before using them specifying that the maps and report are looking at the national level. Ana extended an invitation to make that link and continue the discussion.

WP2 Feedback

The presentation of WP2 came in two halves, focusing on governance maps and values and preferences.

Following the portion focused on governance maps of Conservation, Fisheries, and Aquaculture in Northern Ireland, participants were asked:

- What do you think of the sequence of concentric rings to represent the governance structure?
- We could ask people who they interact with to create a network analysis. Would extra network mapping be of interest?
- What would you like the maps to show that they don't already?

Governance maps

Numerous participants gave feedback on the governance maps. The maps were considered useful visual tools; however, questions arose around making the maps dynamic, considering issues of competition between actors, bias, and language to the detriment of certain sectors, and finally the potential use of the decision support system.

A Useful Tool

The visuals were considered a useful tool for people outside NI – something that could help them identify who to contact. A participant suggested sharing the maps with industry since it takes a long time to fully understand who to contact in the marine sector for things such as

project licensing and renewals planning. The tool would be useful as long as it's relevant for the region of that industry. Accuracy of the map for local knowledge would be an important consideration. Several participants suggested that some "fresh eyes" should look at the maps to make edits that would improve the accuracy of the maps. The Fisherman's Safety Forum and the Northern Ireland Agriculture Representative Group were also identified as missing from the maps.

One participant asked the purpose of the maps, what was trying to be achieved and if they were being used to steer the Work Package. Others sought to understand the bounds of the map, and which sectors they were meant to represent. Finally, a participant asked whether the interview data was weighted depending upon who spoke, noting that some of the most influential people have the least interest in speaking to stakeholders in the fisheries sector.

Co-I Gina Yannitell Reinhardt pointed out the static nature of the maps, noted there was not weighting of interview data, and asked whether participants use maps that show power relations. One participant noted that granularity of levels of responsibility in the organisations would be important when it came to influencing individuals. The difficulty of contacting the right person at the right level in DAERA was given as an example for a recent event of removing a beached whale.

Dynamic Network Diagram and Bias

One participant felt the networking diagram with large and small nodes as a function of the centrality of their connections might cause distraction regarding whose circle was bigger or more central. The same participant raised the issue of bias and language used in MSPACE slides throughout the day. The participant noted the use of the words *conservation* and *exploitation* painting marine industries in a negative light and conservation in a positive light, and an emphasis on emissions of people who use the sea. And finally, the description of Conservation NI – an ENGO – appeared to use reductive language by stating that it "aims to restore health by addressing overfishing", which is not the definition of an ENGO. Gina clarified that the description used was that of the specific organisation, not a general definition of ENGOs.

Decision Support System

One participant asked about the MSPACE decision support system. If the system allows different stakeholders to enter a "best scenario" for fishing for example, then they could see what it looks like and put it forward to influence policy and potentially create multiple areas of conflict. The decision makers will have certain biases and privilege certain areas that look favourable to their preferred outcome, which may be problematic. Gina acknowledged that decision makers will always have those biases, and they will always have the things that they want to prioritise. The question is, can they also have data for that, and a system that shows them, if you implement your bias, what is predicted to happen? What effect does implementing your bias have on all of these other elements in the system? So we're not eliminating bias. The decision-making system could be used as an arm to make decisions to do damage or influence relations and create conflicts. It would also make decision makers better informed when they make their decisions.

The second part of the presentation addressed the question of values and preferences of the different stakeholders with the objective of recommending untapped avenues for interaction to pursue most important and shared values.

Feedback – values and preferences
The presentation on values and preferences included graphs of various attributes that people associate with the marine space in fishing, conservation, and aquaculture, rated on a scale from 0 to 100. People were asked in which sectors they consider themselves to be involved or working. The information from these interviews is building knowledge to carry out a wider survey of each sector. Participant questions asked for clarification, pointed out the importance of the renewable energy sector and their values and preferences, the place food provision holds for fisheries and aquaculture, and how an individual may value an attribute differently if they are involved in it.

Gina Yannitell Reinhardt asked for help from participants in getting the future wider survey (WP4.1) out to the different actors in each sector and increase the number of responses, which will improve the estimates of what the true values are. This will go into the final decision support tool to indicate what is important and what people prioritise. It will give planners an element of feasibility in their work.

WP3 Feedback

WP3 presented the input/output model to analyse ocean related activity. Numerous questions were raised by participants around data sources and the disaggregation of the data notably for the region of Northern Ireland, fishing and aquaculture, the linear nature of the model and its applicability to certain sectors, and finally the anticipatory nature of the model for economic activity.

Data for Northern Ireland
One participant pointed to the difference between data on a UK-wide level versus a regional level. The data presented for greenhouse gas emissions are for the UK-wide level. For Northern Ireland, those values will change. For example, the nephrops' and scallops' emissions are below the average for UK-wide emissions. Alberto Roca Florido (WP3) confirmed that the information will be disaggregated for Northern Ireland, however he has yet to collect data.

Model Assumptions
Questions arose around the linear relation of the model (investment and output), the disaggregation of the data per sector (for example the how aquaculture is defined) and the role of technology. A clarification question was asked by two participants who wondered if the model was based on a real-life situation since quite often investment doesn't necessarily mean an increase in employment if there is automation or mechanisation that sometimes creates a reduction in employment. A second participant gave the example of fishing which is capped by quotas. If 1£ million were invested to replace old hulls, the better technology would lower employment. The simple fact is that if there was significant investment in the fishing industry, fishing greenhouse gas emissions would go down. The model is flawed given this example and there is a need for models that reflect the industry. Another point is around the food security argument and whether the model could present GHG per kilogram food produced, which would tell a more rounded and informative story.

Anticipatory Capacity Provided by Model

Three participants mentioned that the model may not capture the primary fisheries for Northern Ireland, which are spatially restricted based on a static habitat that will not shift (nephrops located in the seabed). Ana Queiros explained the anticipatory capacity of the climate modeling of where those changes are going to happen.

Following the Q&A, researchers handed out a feedback worksheet asking six questions:

Q1: How could you use this analysis to help your decision making?
Q2: What would make this analysis more useful to you?
Q3: What are the things that limit the usefulness of this analysis for you?
Q4: Do you think we are making any major errors because of the assumptions we have made?
Q5: Looking at the figures, are these what you would roughly expect to see?
Q6: Is there anything else you would like to share with us?

Thirteen participants responded. Three respondents answered all six questions.

Q1: Respondents indicated that the input/output economic analysis could help in their decision making in the following ways:

- Demonstrate the GVA to a specific region for bases of investment and how it compares to other sectors to 'put it into context'.
- Give basic insight into the costs and motivation of partners in the industry and government
- Look at cost and benefits on investments in different areas.
- Provide advice to specialist policy makers on if/how this would influence marine planning policy for that sector.
- Help scenario explanation and considering various approaches.
- Understand economic impacts directly and indirectly for a variety of decisions or decision approaches.
- Inform funding areas (with subsequent benefits for the seafood industry).
- Support lobbying efforts.

Several respondents also noted concerns about the analysis:

- It is not directly applicable to the conservation sector and creates concern on how this relates to the conservation sector.
- Does not consider ecosystem-based services that come from the marine environment. Need to incorporate economic value from ecosystem services.
- Concern for model that focuses solely on economic growth - does not align with marine conservation and restoration. Could be quite damaging to assume infinite linear growth.
- Not sure that the linear relationship is an appropriate assumption when it comes to fisheries.

Q2: Respondents indicated the analysis would be more useful if:

- It included specifics i.e. breakdown of aquaculture into sub-sectors and compared to other regions/nations in the UK.
- It included figures for the annual value of each sector.

- It considered natural capital, intangible benefits, and limits due to policy.
- It considered physical limitations such as habitat availability.
- It considered sustainability such as stock.
- It indicated the upper 'ceiling' limits for models.
- It included a greater quantifiable understanding of ecosystem services, catch efforts, maximum sustainable yield, etc., and incorporated potential impacts for conservation from investment.
- It highlighted within the graphs where the most sustainable investment options are.
- It added a conservation element or showed impact of investing in sectors to do with renewable energy/eco-tourism/species conservation.
- It included caps and interdependencies.
- It explained how scenarios and outworking balance with environmental social limits.
- It incorporated additional criteria and showed how the model accounts for CEPS[1], limited resources.
- It indicated specific examples illustrating the implications for investment and GVA impacts, such as "a £1m investment in catch tech would have xx financial impact".
- It showed a measure of emissions vs kg/food produced.

Q3: Respondents found the usefulness of this analysis was limited by:

- Lack of their own general economic awareness for each sector, across sectors, and general economic expertise.
- The assumptions and lack of data (a list of data sources should be included alongside these results - if we haven't planned to do so already).
- The inter-linkages of different areas.
- Not being specific enough, such as in aquaculture
- Omitted past GVA values
- Lack of highlight in priority order of the impact of the investment, that is, what has most vc impact.
- The data deficiency in the aquaculture sector and the lack of data to do with economic impacts of biodiversity loss.
- The lack of relevance and thought in relation to investment for sustainable, environmental process. Not currently relevant for ENGOs.
- The need to tie in environmental limits and wider impacts on society and communities.
- The need to incorporate ecosystem services value, potential impacts for conservation from investment, fisheries focused.

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[1] **CEPS** stands for **Centre for Environment, Fisheries and Aquaculture Science**. It is an organisation that collects and maintains data on fish, shellfish, fisheries, and related samples in the UK[1]. The organisation's data is predominantly marine but covers transitional waters and migratory species[1]. CEPS has prioritised EU-mandated fish surveys that are part of established series[1]. It contains data collected by UK research vessels on the most recent international bottom trawl surveys, covering significant geographical areas, species, and environments[1]. CEPS also has data from England, Wales, and Scotland[1]. In time, data from Northern Ireland will be included[1].
Source: Conversation with Bing, 09/10/2023 which consulted the following sources:
(1) Fisheries Data Archive Centre - Cefas (Centre for Environment .... https://www.cefas.co.uk/data-and-publications/fishdac/.
(2) Penny Bun - Wild Food UK. https://www.wildfooduk.com/mushroom-guide/cep/.
(3) The Best Places to Go Fishing at Sea in the UK | Angling Direct. https://www.anglingdirect.co.uk/community/top-sea-angling-marks-where-can-you-go-sea-fishing-in-the-uk/.

- The fact that fishing has sustainability limits. Increasing the capacity of a sector through investment may not lead to increased annual catch over the long term.
- How does the model account for CEPS, limited resources?
- Lack of recognition that fishing effort is capped.

Q4: Respondents indicated the following errors and comments due to assumptions made:

- The assumptions don't allow an accurate representation of the economic impacts of investment in the sector.
- There is not infinite linear growth in employment, catch per unit effort.
- The relationships can vary, for example with Maximum Sustainable Yield (graph).
- The work it is solely fishing/aquaculture focused, not considering indirect impacts on other sectors or the environment and natural capital.
- More investment in NI fisheries should lead to less emissions, not more.
- In terms of investment equalling employment.
- Are the caps, gvdu, vessels fish to process and sell.
- Linking NI to UK in terms of trends and modelling projection could be problematic.
- Single focused? Need to incorporate other impacts.
- Models may work for many sectors such as maritime transport, but wild fisheries are heavily dependent on ecosystem constraints, therefore input-output models do not seem valid.
- Need to ensure the assumptions are very clearly explained in the report.

Q5: When looking at the figures, respondents indicated if they were roughly what they expected to see and commented:

- Based on the assumptions, the figures show a simplified projection of expected GVA, Income and Output results, however, it is unlikely that the information is an accurate representation of the economy.
- Sort of - surprised by retail <- consumer demand driven.
- Not sure why ship repair has such low multipliers, etc. Surely keeping vessels afloat for freight transport, fishing, etc. is vital to continued economic output.
- Impossible to know without knowing specifically what the investment is in, such as research/innovation/tech….
- Not sure what to expect, will need to consider them further, don't have expertise to comment, don't know, lack of relevance.

Q6: Respondents shared following additional comments:

- There is a need to consider doughnut economics in relation how a 1 million investment will change impacts on both the social foundations and planetary limits.
- Similar project on nearnt [sic.] app (not specified)
- Possibly an indicator of sustainability such as growth – when do we stop or change? Does report advise on this?
- The inclusion of environmental limits, limited resources, and the sustainability UK decisions.

- Current economic system of linear growth does not align with majority of thinking around sustainability. Need Environmental caveats to ensure sustainability. For Natural Capital - worthwhile chasing DAERA Manaca tools - tool that quantifies natural capital in NI Seas.
- It would have been worthwhile sharing the draft outputs with contributors interim; it appears the final report is complete and will certain results that have been queried by stakeholders today be incorporated?
- Request to email a participant for more fishing input.

Afternoon Workshop Analysis (WP2 and WP4)

The afternoon workshop consisted of a worksheet filled out by participants and a plenary discussion on their responses. Each participant was asked to individually fill out a worksheet based upon their current professional role that included a list of potential characteristics of climate smart marine spatial plans. The 15 characteristics were the following:

conservation designations	economy	governance
learning & research	water quality	health
identity, culture, heritage	biodiversity	food provision
leisure and recreation	biosecurity	climate change
transportation & shipping	tourism	energy

The worksheet also included the following prompts:

Q1. Circle or otherwise indicate which (if any) of the criteria you think are important in evaluating a climate smart marine spatial plan.
Q2. Do you think any of them are more or less important than others? If so, please use numbers to indicate which you think might be the first most important, second most important, etc.
Q3. Do you think any important criteria are missing, or should be added? Please write in ideas you have about criteria we may have missed – things you think are important.
Q4. Are there any you would remove as unimportant? Please feel free to cross out (strike through) any you think are unimportant.
Q5. If you have any additional comments about any of the above, please write them below. We are particularly interested to know whether your personal or professional thoughts about evaluating climate smart marine spatial plans have changed at all as a result of participating in your group discussion. Are there any criteria you think about differently from the way you thought about them this morning?

Fourteen participants carried out this exercise. The largest group was from the Conservation sector, followed by marine planning, fisheries, and fisheries/aquaculture as indicated in Figure 1 below.

Figure 1. Sectors Represented by Participants in Belfast Workshop

Sectors Represented

- Conservation 36%
- Fisheries 21%
- Fish/Aquacul 7%
- Marine Planning 29%
- Development 7%
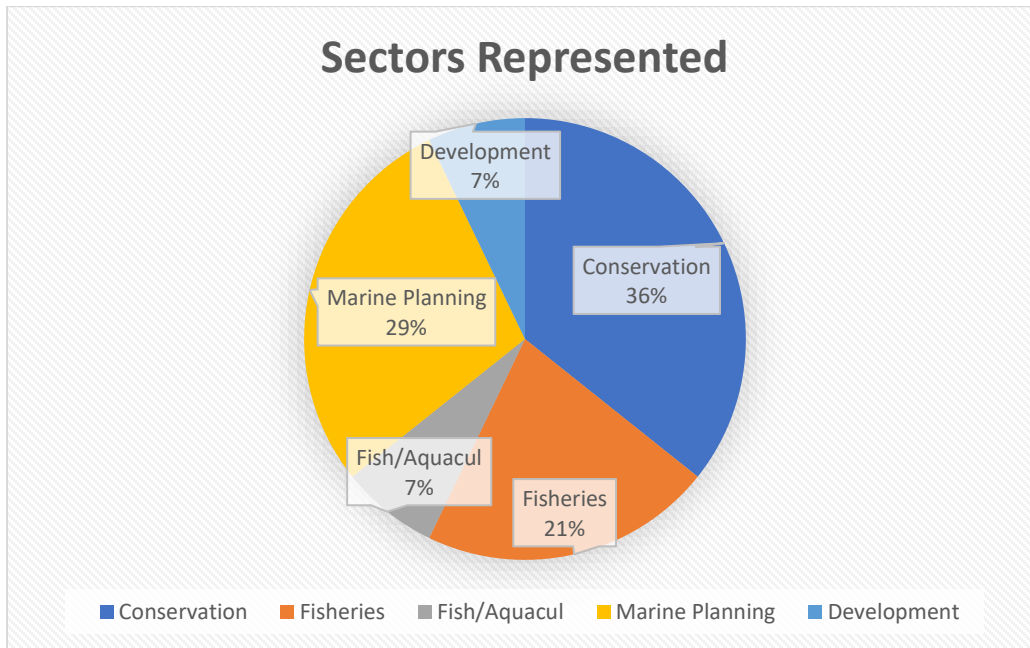
The analysis was carried out in three steps, first looking at the worksheet written responses and the frequency of ranking of different elements overall, and then by sector. Second, analysing the additional elements and comments given on the worksheet. Third, coding and analysing the transcript of the discussion held in the afternoon on the worksheet by the whole group.

Analysis of the worksheet was carried out by reporting responses in an excel table to assess common responses overall and by sector of activity, and to compare the ranking of items, the additional suggestions, and the comments. Tables, charts, and word clouds were used to help visualise the data. Coding of the discussion transcript was carried out using Dedoose[2] qualitative analysis software.

Criteria of Importance in Evaluating a Climate Smart Marine Plan

All participants received the same instructions and worksheet, however, each person responded to the criteria in a different manner. Later, participants remarked that it was difficult to prioritise one element over another or select some as most important because they are all inter-related, and due to the increase in both activity and knowledge about the marine space. Table 1 lists the different ranking methods used by participants.

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[2] Dedoose Version 9.0.17, cloud application for managing, analysing, and presenting qualitative and mixed method research data (2021).

Table 1. Typology of Ranking Methods Used in Belfast Workshop

Ranking Typology	Number of Participants
Ranking some of the items (4, 5, 6, 8, 9,13, 14 or 15 of them) whilst leaving the others unranked	10
Ranking some of the items (4 or 5 of them) with several elements tied in each ranking level	3
Indicating all elements as equally relevant with no ranking	1
Total	14

An analysis by frequency of the elements in the top five rankings shows that biodiversity, climate change, conservation designation, governance and food provision are the most valued criteria among the participants. The economy, learning and research, and water quality follow closely behind. Figure 2 illustrates these rankings in a word cloud.

Figure 2. Highest Ranking Criteria Whole Group

Each sector presented a different rank ordering of characteristics. Fisheries and Aquaculture participants both ranked food provision as the top value and conservation designation as the 5th value. Water quality, climate change and biodiversity were all included in the ranking; however, they were positioned differently among participants within the fisheries sector. Figures 3 and 4 indicate the ranking of criteria in Fisheries and Aquaculture.
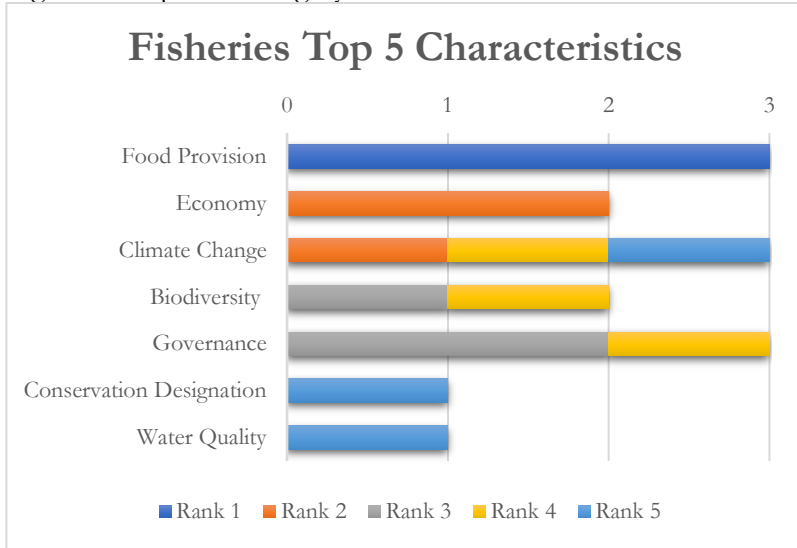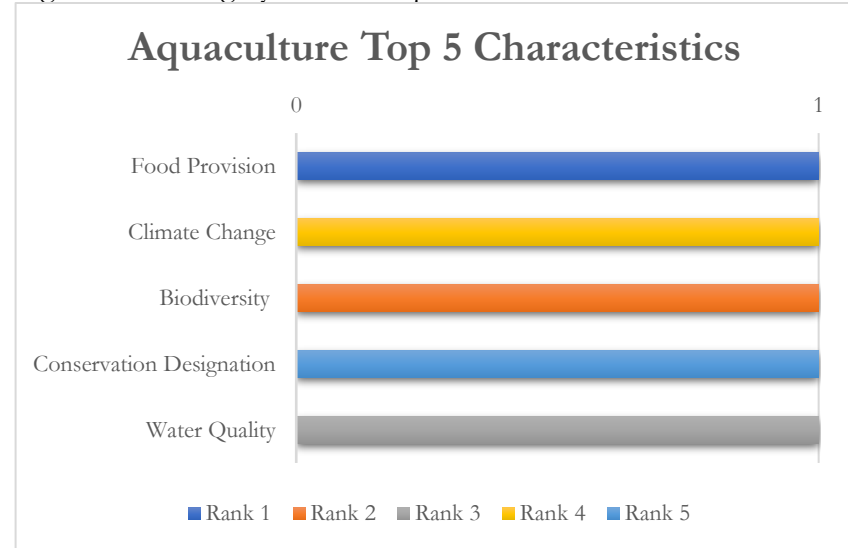
Figure 3. Top 5 Ranking by Sector: Fisheries

Fisheries Top 5 Characteristics

Figure 4. Ranking by Sector: Aquaculture

Aquaculture Top 5 Characteristics

Note: One participant identified as working exclusively in the sector of Aquaculture

The Conservation sector ranked biodiversity, conservation designation and climate change among the first 3 elements of importance. Two of the five respondents ranked several elements per level. For example, for one respondent Rank 1 contained conservation designation, economy, water quality, biodiversity, health, food provision, climate change, energy. In addition to the multiple elements per ranking level, one respondent added two elements (Agriculture and Transboundary Impacts and Politics). Figure 5 indicates the ranking for the Conservation sector.

Figure 5. Ranking by Sector: Conservation

Conservation Top 5 Characteristics
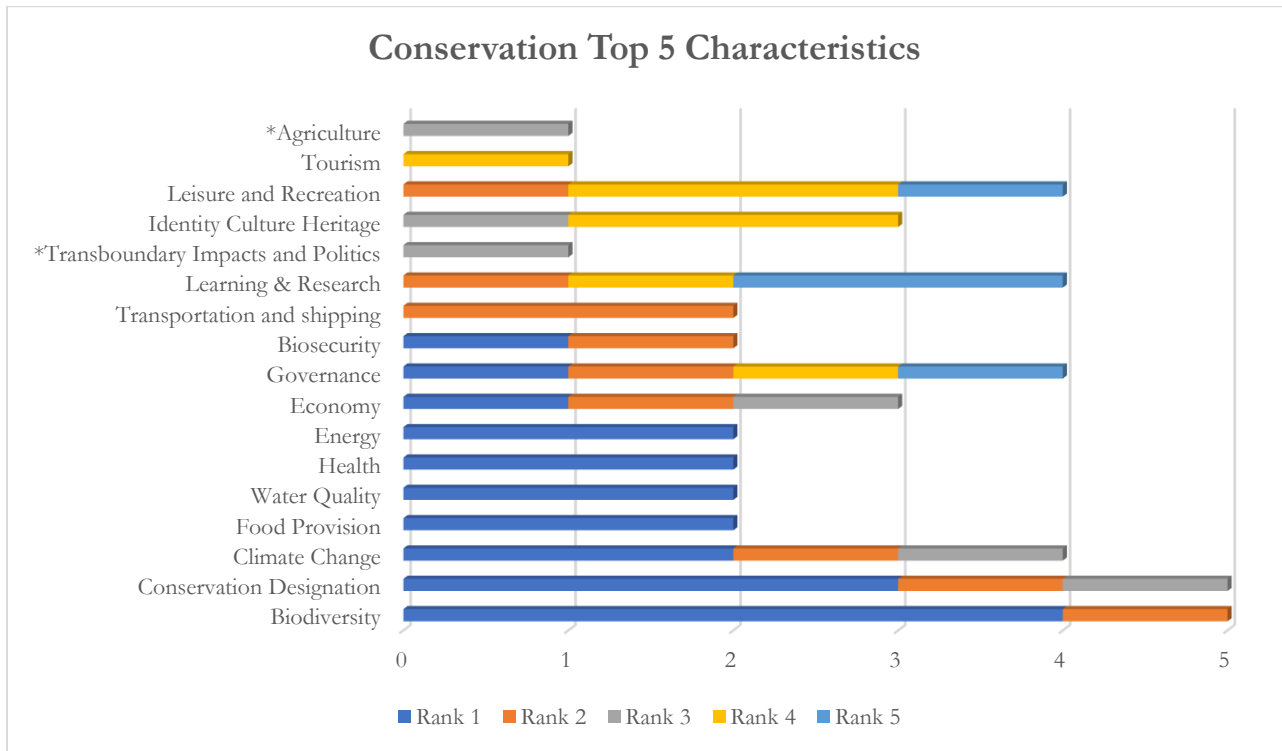
Notes: *Additional criteria indicated by participant; 2 participants included several characteristics per rank level.

The Marine Planning participants held a variety of roles in planning (policy development, all sectors, fisheries/conservation/aquaculture). Only biodiversity garnered the largest number of similar ranking responses among planners. One respondent ranked conservation, biodiversity, and climate change in Rank 1. Figure 6 illustrates the ranking for the participants from the Marine Planning sector.

Figure 6. Ranking by Sector: Marine Planning

Marine Planning Top 5 Characteristics
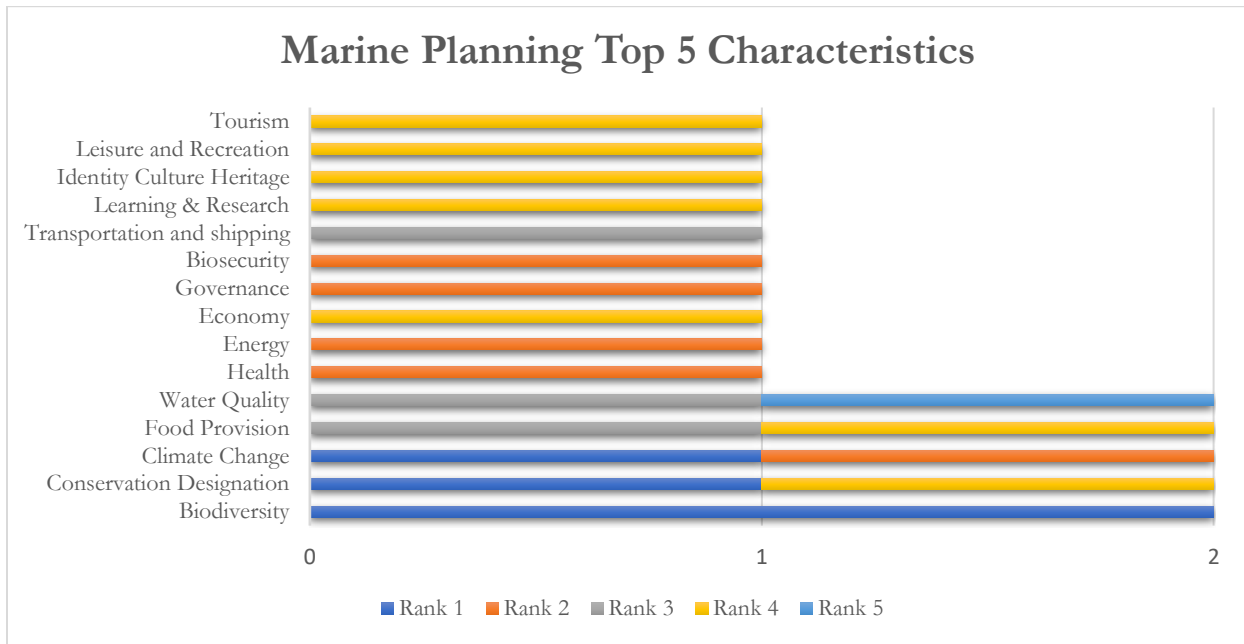
Note: One participant did not rank any of the characteristics, stating that they were all important.

Criteria Missing

Participants added criteria to the 15 characteristics indicated. Precisions on sectors that should be included as well as climate change phenomenon and responses dominate the suggestions. Figure 7 illustrates the additional characteristics by theme and then lists the suggestions grouped under each theme.

Figure 7. Themes: Additional Characteristics

THEMES: ADDITIONAL CHARACTERISTICS
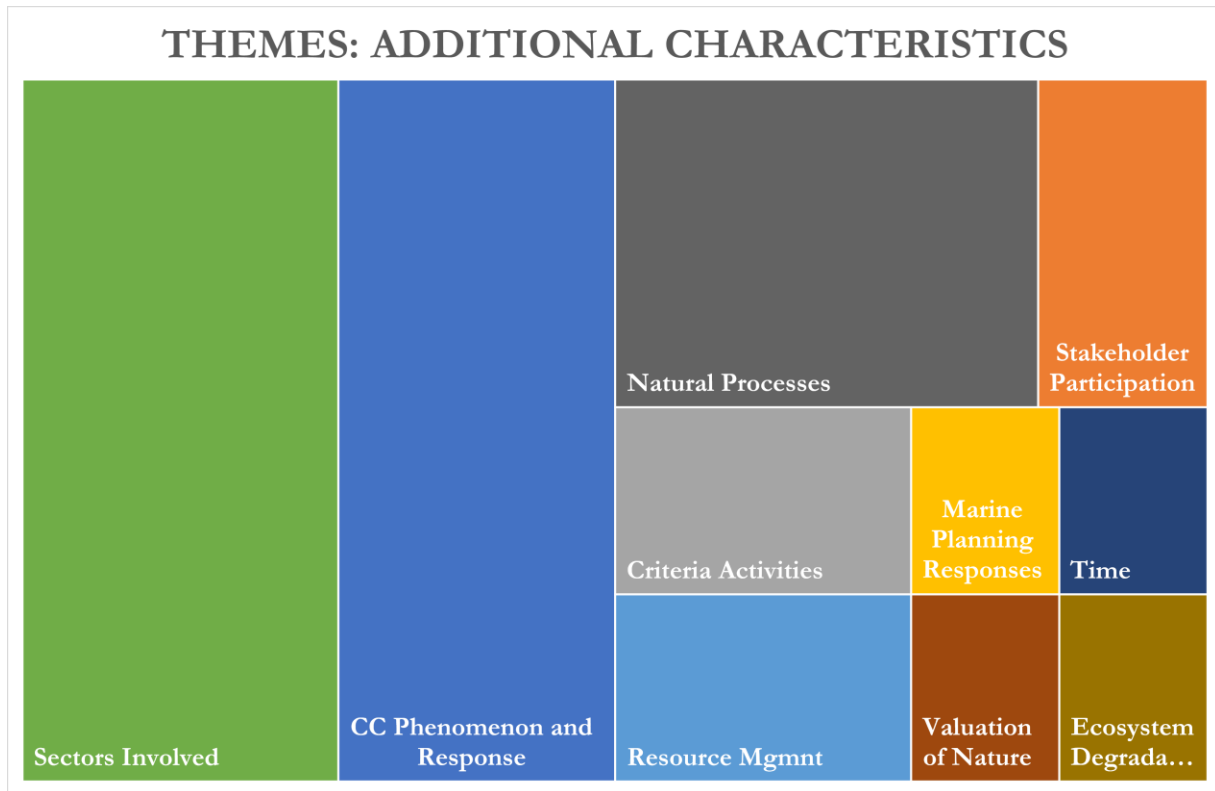
| Sectors Involved	Additional Sectors in Area, Agriculture, Aquaculture, Defence Military, Energy, Fishing, Industry Applications Renewable Energy
CC Phenomenon and Response	Coastal Erosion, Impacts, Local Impacts, Coastal Protection, Climate Change Adaptation, Climate Change Mitigation
Natural Processes	Coastal Processes, Ecosystems, Geodiversity, Land and Sea Interaction/Interface
Criteria for Activities	Governance Wider Community Criteria, Sustainable Development 3 Pillars, Wider Environmental Criteria
Resource Management	Transboundary politics and impacts
Stakeholder Participation	Buy In / Understanding, Relevance
Marine Planning Responses	Co-location
Valuation of Nature	Ecosystem Services
Time	Time/Urgency
Ecosystem Degradation	Litter and Light Pollution

Unranked and Crossed Out Criteria

Over 70 percent of the participants (10 out of 14) did not rank elements in the list in one of two ways:

1) They did not rank the element.
2) They crossed out the element.

Figure 8 below indicates the elements according to the two categories. Tourism and health were the most frequent elements to be crossed out (tourism) or not ranked (health).

Figure 8. Elements Unranked or Crossed Out (all participants)
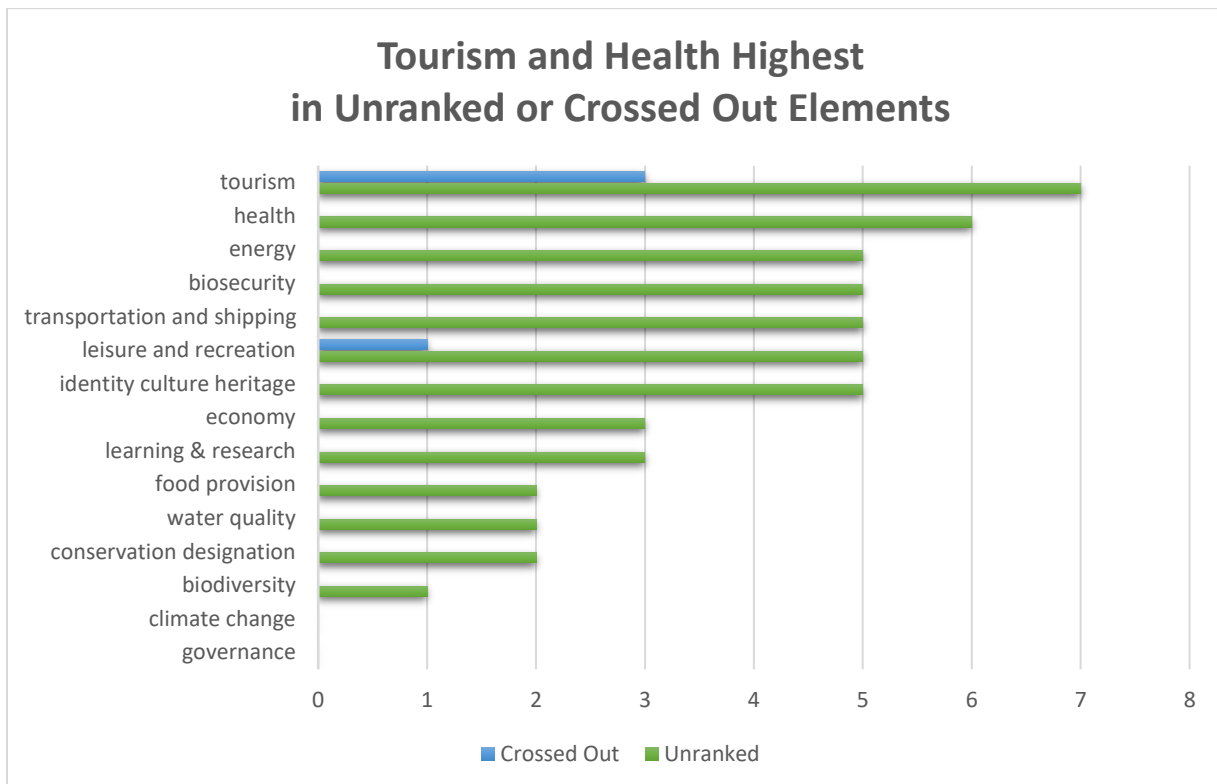
Additional Comments

Participants provided additional comments, which focused on three aspects of the exercise: the exercise itself, clarifying information, and the use of the criteria in marine planning. Comments on the exercise of ranking criteria pointed to the difficulty of ranking the elements, their interconnectedness, and how all are important.

Comments meant to clarify information focused on specific links between elements, such as that fishing is linked to food provision, or that climate-change can be divided into mitigation versus limiting impact. Further comments mentioned limiting factors to be taken into consideration, such as seed mussel as a resource to the mussel industry and potentially impeded by climate change with a knock-

on effect on industry. Some also mentioned the impact of the elements as a function of sector goals from a policy development perspective, and which element has more impact on growth.

Comments on how the elements will be incorporated into marine planning took three forms. First, a suggestion: *Through a range of scenarios for the climate smart spatial plan*. Then a comment: *Considering these as categories not criteria*. And finally, an interrogation: *What is the criteria for good?*

A second comment pointed to the nature of marine plans:

> *Plans cannot be overly rigid. Clear aims are needed, and targets must not be changed – but in response to unknowns (at present), data gaps and unforeseen events, a plan must be adaptable. Data will improve, understanding will improve, transparent logical frameworks must be in place that can be used and updated. A static set plan, an 'old report' will become unimportant unless it can be re-evaluated and updated.*

Plenary Discussion

Gina Yannitell Reinhardt led a general discussion after participants had time to complete the worksheet. Participants were asked if they had any thoughts about the elements and any that might be missing. The following plenary discussion focused on four major themes: additional attributes, existing assessment criteria, operational definitions of criteria, and how to gain the interest of the target (sector) public for a climate smart approach. The discussion highlighted: the importance of distinguishing between climate change limitations, adaptation, and mitigation; the numerous existing statutory requirements that feed into marine planning; the importance of time; impacts; and envisioning improvements supported by government for the fisheries sector. Finally, discussion on target publics and how to get them interested in climate smart marine planning emphasised the necessity to speak each sector's language, use criteria that matters to them and address some of the planning issues such as inflexibility for certain sectors (conservation designations) and flexibility for others (fishing and aquaculture). Table 2 lists the key points of this discussion for the four major themes.

Table 2. Plenary Discussion Themes: Attributes, Operational Definition Criteria, and Gaining Interest in Climate Smart Approach

Additional Attributes	Existing Assessment Criteria	Operational Definition Criteria	How to Gain Interest of Target Public for Climate Smart Approach
• coastal protection • climate limitation • climate adaptation • climate mitigation • ocean acidification • 3 pillars of sustainable development: social, environmental, economic • planetary boundaries[3]	• Existing targets, objectives, things that statutory sectors/actors are required to do • sustainability • emissions reductions • *MSFD Perspective • *Water Framework Directive • *INTA • *SSRI	• Time span for positive impact – 5 years, 25 years, 200 years. • Relation between fuel consumption, CO_2 emissions, number of days of fishing • Impacts on each sustainability pillar and interaction between pillars • Impacts positive and negative • Conservation designations	• Framing with solutions approach • Gain buy-in and understanding through language and terminology understood by sector • Gain buy-in and understanding by touching on the pains of industry and distinguishing climate smart tool from other approaches • Promote opportunities such as co-location via climate smart approach • Catch caps protect sustainability in Fisheries, look to decrease number of trips and amount of time necessary to reach cap levels • Address inflexibility of conservation designation areas

*Notes: MSFD refers to European Marine Strategy Framework Directive converted into UK law; Water Framework Directive refers to the transposed European Directive to take a holistic approach to the management of water quality of rivers, lakes, estuaries, coastal waters and groundwaters; INTA refers to Committee on International Trade at the European Parliament, SSRI refers to Sites or Areas of Special Scientific Interest which are protected areas designations established under National Legislation.

Conclusions on Worksheet Exercise and Plenary Discussion

Fourteen participants carried out this exercise in 14 different ways. They demonstrated the difficulty of selecting one criterion over another in the marine space and ranking their importance. However, biodiversity, climate change, conservation designation, governance and food provision came through as highly and frequently ranked criteria group-wide. The economy, learning, and research and water quality were selected next in order. The ranking within each sector varied as well. Fisheries and

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[3] A framework according to the Planetary Boundaries - Stockholm Resilience Centre

Aquaculture ranked food provision in first place. Conservation and marine planning ranked biodiversity as the first element. The workshop approach sought to get a snapshot assessment of these elements with a varied group of participants who had all learned of the 3 MSPACE work packages and the intention of the research.

There are 3 key elements that come through this qualitative worksheet approach that sought to identify general criteria (concepts) that could help specify designated criteria (operational definitions) in subsequent scenario planning sessions.

1. The top five highly valued criteria identified group-wide are: biodiversity, climate change, conservation designation, governance, and food provision. The economy, learning and research and water quality follow closely behind. The most frequently unranked or crossed-out criteria were tourism and health.

2. There is a difficulty in ranking criteria given the interconnectedness of the elements or the unwillingness to indicate which sectors may experience a decline or more restrictions. The difficulty participants encountered here is consistent with the previous interview subjects' tendency to rate several elements equally and suggests that rating is more natural to participants than ranking. Additionally, one participant raised the point that criteria may be valued as a function of sector goals from a policy development point of view, or a function of which criteria has more impact on growth. In other words, policy decisions may influence the values and preferences and determine the trade-offs.

3. Additional criteria were mainly sector and climate change phenomenon and response oriented. This may point to the increasing necessity to consider a wider range of sectors that have an effect on or depend on the marine space. Climate change effects on the coast (impact, erosion) leading to responses such as mitigation and protection point to the necessity to not only assess but respond to the phenomenon as it is occurring now and look at predictions to understand the possible (probable?) evolution. This recognises the importance of being able to predict and respond to climate change in the planning process.

The plenary discussion echoed many of the points raised on the worksheet, namely the interconnectedness of the attributes. However, participants pointed to the importance of the existing sectoral statutory requirements and the 3 pillars of sustainable development (social, environmental, economic) as guidelines to consider alongside the climate smart marine planning approach. Finally, participants addressed the question of buy-in and understanding of the climate smart approach and emphasised the necessity to speak the sector's language, use criteria that matters to them and address some of the planning issues such as inflexibility for certain sectors (conservation designations) and flexibility for others (fishing and aquaculture).

Participants also addressed broader concerns. These concerns include the wider issue of the carbon footprint of food (seafood vs land-based food), the sense that regulation based on past concerns (legacy regulations) yet present today is not acknowledging the current context and possible solutions, that everyone needs to know what the trade-offs are, and finally that Northern Ireland has a smaller area to work with, therefore spatial squeeze will be felt more across the sectors.

Workshop Achievements and Outcomes

Strengths

The workshop went smoothly, with participants actively engaged with the materials and willing to comment. Several participants mentioned they appreciated the workshop and the time spent reflecting. The worksheet exercise was clearly understood. Participants spoke freely throughout the workshop and during the plenary discussion. No open antagonisms were present.

Challenges

There were two key challenges during the workshop. First, there were technical difficulties accessing the hybrid capacity of the room, and not enough MSPACE team on hand to fully resolve those issues as well as attend to other workshop needs. Having the workshop on a Monday complicated these problems because the MSPACE team was unable to visit the location or test the system in advance, and so only began trying to access the hybrid system an hour prior to the event start time. NI Case Lead Billy Hunter was instrumental in resolving problems and getting local IT support. One of the problems also came from Microsoft Teams, which would only allow the meeting creator to invite new participants online. Since the links/invitations had been created by PM Luz Rodriguez-Garcia and she was unavailable that day, Billy was also helpful in creating an entirely new meeting to invite the hybrid room system. Still, we experienced a delay in getting the workshop started (10 minutes), and several points where the connection was dropped, either to the room or to the online participants.

Second, the time allotted for each WP was not enough to accommodate the active attention and engagement of the participants. The afternoon workshop plans were therefore modified as the Q&A periods for the morning session caused the WP presentations to run over their allotted time. Their engagement in the morning was an important factor for the participatory exercise in the afternoon, which was changed by eliminating small group work and going straight to plenary discussion with the worksheet. No participants left the afternoon work session.

Potential Improvements

Suggested changes for the morning session:

- Allow more than one hour prior to the start for the IT manager and MSPACE team to check connections and hybrid set up. Perform checks the day before the workshop, if possible.
- Make sure the people attending have the capability to invite new people from within the Teams system (not simply by forwarding an invitation/link from the organiser).

Logistical Considerations

- The session was recorded and then transcribed using an I-phone and Word transcription function, because recording in the new Teams links (which had to be generated to access the room functions) was not possible. This helped in the workshop analysis for precision and verification.

Pre- and Post-session Survey Results

To help track impact, the team had intended to ask participants to complete a survey twice – once at the end of the morning session, and again at the end of the afternoon session – as had been done with participants at the workshop in Stromness. The pre-session survey was not requested from participants due to the multiple technical issues the morning session experienced from the start, though some people did see it in their packets and complete it anyway. The Team then did ask each person to complete the post-session survey. Seven of the nineteen participants filled out both the pre and post survey, generating 14 completed surveys for 7 matched pairs. The following charts are based on those results. Four participants filled out only the pre-session survey. An additional 8 participants filled out only the post-session survey.

How well do the participants understand the likely impacts of climate change for Northern Ireland in terms of 3 issues of key interest to MSPACE?
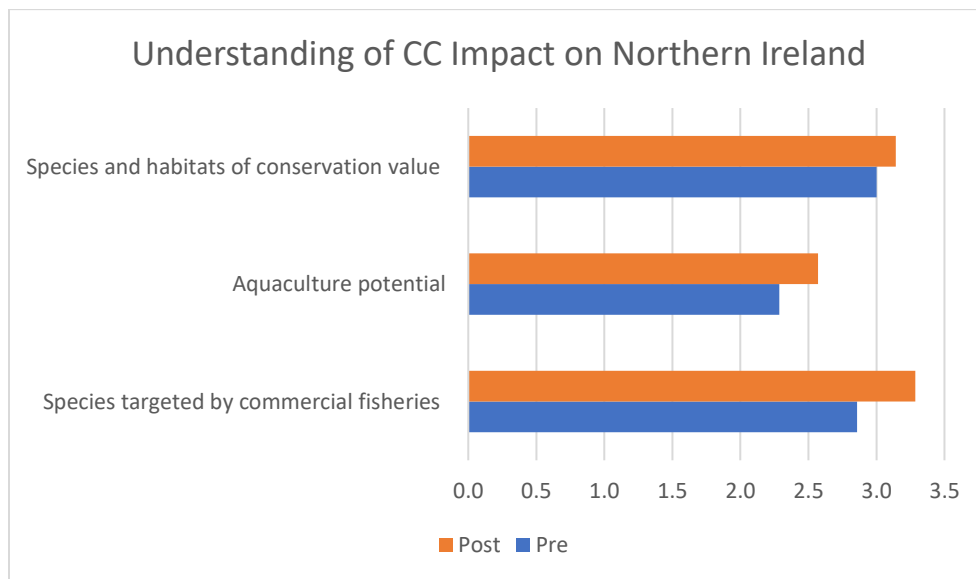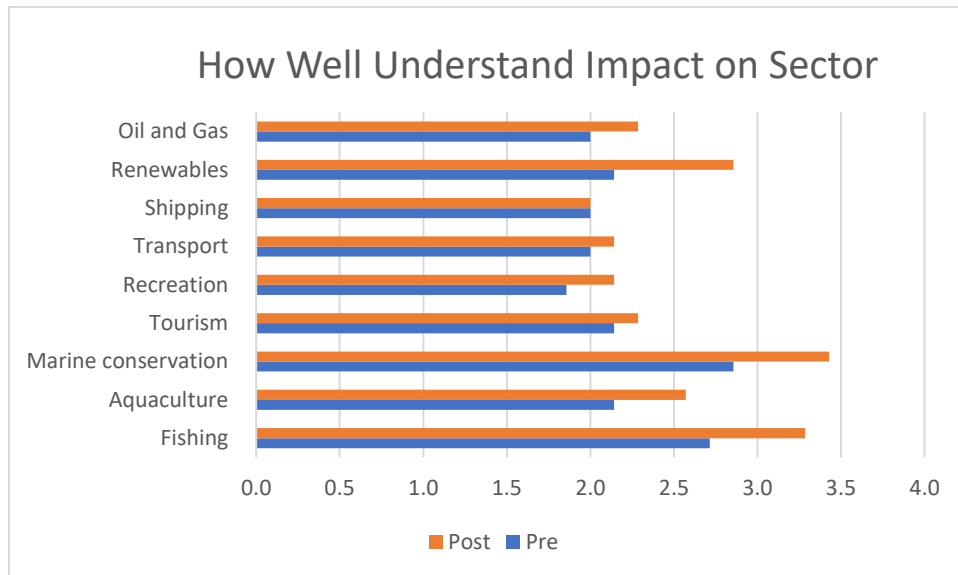

Responses on a scale of 1(not at all) to 5 (completely)

Figure 9. Pre- and post-session average understanding of the likely impacts of climate change for Northern Ireland in terms of 3 issues of key interest to MSPACE

Figure 9 reflects the fact that the average perceived understanding of the group improved after the workshop, compared to before the workshop, in terms of the likely impact of climate change for Northern Ireland on species and habitats of conservation value, aquaculture potential, and species targeted by commercial fisheries.

Statistical analysis reveals that individually, there was a statistically significant change in self-assessed understanding of the impacts of climate change for Northern Ireland on species targeted by commercial fisheries (average individual change was to increase 0.42 points in understanding on 1-5 scale, $p<0.05$), but not on aquaculture potential or species and habitats of conservation value.

How well do the participants understand the likely impacts of climate change by sector?

Note. Responses on a scale of 1-5 (1 not at all – 5 completely)
**Figure 10. Pre- and post-session average of how well participants understand
likely impacts for climate change, by sector**

Figure 10 shows that the average perceived understanding of the group improved after the workshop, compared to before the workshop, in terms of the likely impact of climate change on the following sectors: oil and gas, renewables, transport, recreation, tourism, marine conservation, aquaculture, and fisheries. We see no change in the average perceived understanding of the group of the likely impact of climate change on the shipping sector.

Statistical analysis reveals that the average per-person change in self-estimation of understanding was not statistically significant for fishing, aquaculture, marine conservation, tourism, recreation, transport, shipping, renewables, or oil and gas.

Several participants felt that their understanding was improved after the workshop. Table 3 below reflects participants self-assessment of improvement.

Table 3. Participant Self-Assessment of Level of Understanding for each Sector

Sector	Number (of 7) who felt their understanding of the likely impacts of climate change improved for the sector
Fisheries	5
Aquaculture	4
Marine Conservation	2
Tourism	0
Recreation	0
Transport	0
Shipping	0
Renewables	1
Oil and gas	0

How have the participants' perceptions of the importance of 4 key considerations for marine planning changed as a result of the workshop?
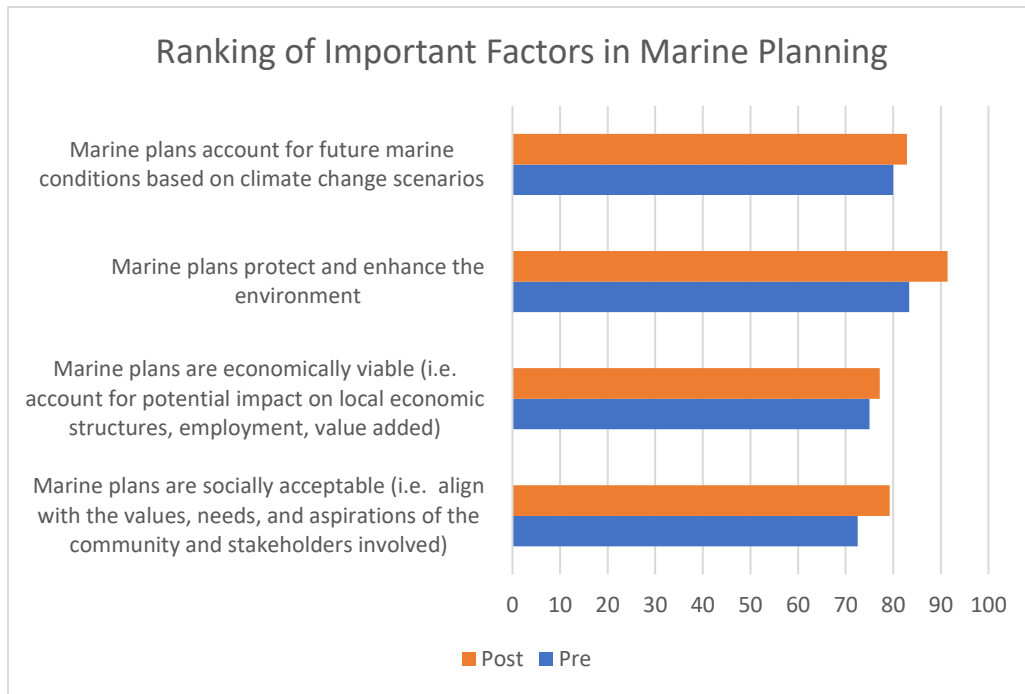
*Note. Responses on a scale of 100 (100 indicating highest importance)*
Figure 11. Pre- and post-session average ratings given to key considerations of marine planning

Figure 11 shows the average pre- and post-session ratings of four considerations that are relevant to marine planning. Each participant was asked to rate each consideration from 0 to 100. The average rating of climate change scenarios, environmental enhancement, economic viability, and social acceptability increased.

Further, the average range of ratings, which stretched from 73 to 80 (7 points) before the session, became more dramatic (greater in range), stretching from 79 to 91 (12 points) after the session.

Statistical analysis reveals that the average per-person change in perceptions of importance was not statistically significant for social acceptability, economic viability, future-predicting for climate change scenarios, or protecting and enhancing the environment.

How concerned are participants about the future of 3 sectors key to MSPACE?
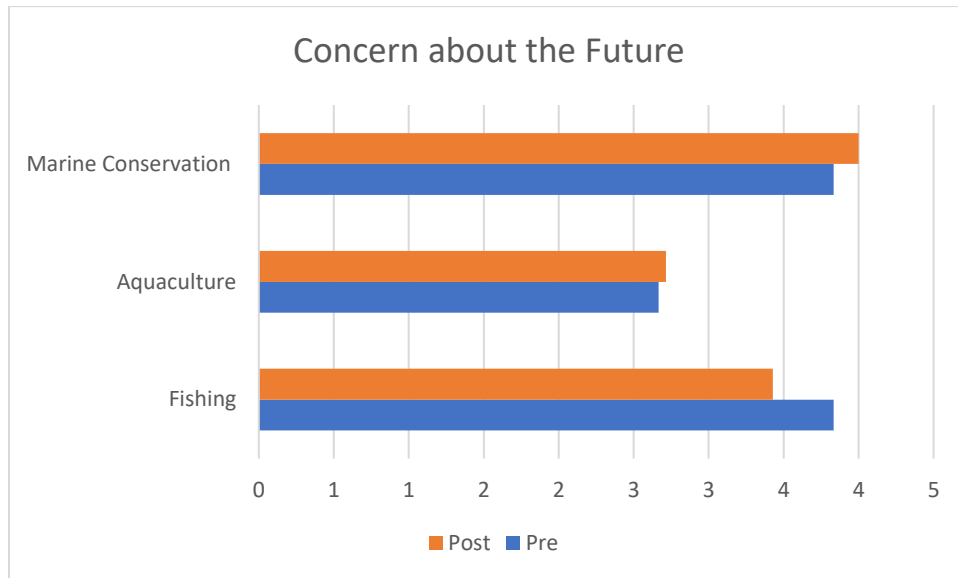
Note. Responses on a scale of 1-5 (1 not at all – 5 completely)
**Figure 12. Pre- and post-session on concern for the future of 3 sectors Fishing,
Aquaculture and Marine Conservation**

Figure 12 shows that the average group concern about the future of each sector increased after the workshop, compared to before the workshop, in all 3 sectors of key interest to MSPACE.

Statistical analysis reveals no statistically significant change in per-person concern about the future of any of the three sectors.

Table 4. Participant Self-Assessment of Level of Concern about Future for each Sector

Sector	Number (of 7) who felt their concern about the future lessened
Fisheries	2
Aquaculture	1
Marine Conservation	1

Additional Comments from Participants

Pre-Session	
Any further comments?	There are none of the marine spatial planning experts here from QUBE, were they invited? It would be useful to get the organisations off Daesa Marine Division that responded to the marine plan consultation. Need to be more investment in data collection to improve the modelling. XXX@nationaltrust.org.uk, also for social questions look at climate ResilRisk Work.
	3 e-mails were left in the comments
Post-Session	
What did you find most useful about workshop?	The discussion and hearing different stakeholders' opinions and inputs
	Interesting to see current MSP work in progress, needs greater application to NI-specific focus
	Understanding of MSPACE, this is a unique project and is essential. Pushing boundaries, doing what is needed, proud to be involved.
	Greater understanding of the complexity and interconnected nature of climate change-based decisions making now and in the future
	Very informative and good to meet the project team. Bringing the project to life to be involved in the workshop.
	1 email was left in the comments

Conclusions

The Northern Ireland workshop was the second of a series of four programmed workshops seeking to first present Climate Smart MSP Work Package progress to date and receive feedback on the outcomes, and second to capture the participant perceptions of the importance of elements to consider in their current role to assess a climate smart marine plan. The afternoon participatory session asked participants to rank the criteria for the marine space and indicate additional criteria to complete the list. Participants provided commentary on how they determine the value of these criteria and other elements to take into consideration.

Each WP received constructive feedback after the WP presentation indicating participant engagement with the material and the usefulness of the information presented.

WP1 key comments focused on renewable energy as a missing sector in the study, data deficiencies, mitigation efforts, the future prescriptive nature of plans and bias towards certain stakeholders.

WP2 key comments centered on the usefulness of the governance maps as visual tools across marine sectors, however questions arose around making the maps dynamic and whether it would be feasible or create issues among the sectors, bias and language notably in portraying the fishing industry and finally the potential negative use of the decision support system.

WP3 key comments focused on data sources and the disaggregation of the data notably for the region of Northern Ireland, fishing and aquaculture, the linear relation of the model (investment and output), the disaggregation of the data per sector (for example the how aquaculture is defined) and the role of technology.

The afternoon participatory workshop session asked the fourteen participants to carry out a ranking exercise assuming their current professional role which was carried out differently by each participant. This exercise demonstrated the difficulty of selecting one criterion over another in the marine space and ranking their importance. However, biodiversity, climate change, conservation designation, governance and food provision came through as highly and frequently ranked criteria groupwide. The economy, learning and research, and water quality were selected next in order. The ranking within each sector varied as well. This qualitative approach for WP4 revealed that tourism and health were most frequently unranked or crossed out criteria; the difficulty (or unwillingness) to rank criteria given the interconnectedness of the elements and policy goals per sector (growth) pointing to the reality that policy decisions may influence the values, preferences and determine the trade-offs; additional criteria indicated were focused on sector and climate change phenomenon and response. This may point to the increasing necessity to consider a wider range of sectors that have an effect on or depend on the marine space and the attention to current climate change effects on the coast (impact, erosion). This recognises the importance of being able to respond to climate change in the planning process and predict future evolutions.

The objective of identifying general criteria (concepts) that could help specify designated criteria (operational definitions) in subsequent scenario planning sessions was partially achieved. The additional attributes proposed are coastal protection, climate limitation-adaptation-mitigation, ocean acidification, and planetary boundaries. Operational definitions proposed include time span for positive impact, relation between fuel consumption-Co2 emissions-number of days of fishing, impacts

on each sustainability pillar (economic, social and environmental) and interaction between pillars, other impacts positive and negative.

The key suggested improvement for the morning WP presentations centers on the need to assure the reliability of virtual connections for a hybrid participatory format.

Pre- and post- session survey results show that the average perceived understanding of the group improved after the workshop, compared to before the workshop, in terms of the likely impact of climate change for Northern Ireland on species and habitats of conservation value, aquaculture potential, and species targeted by commercial fisheries. Individually, there was a statistically significant change in self-assessed understanding of the impacts of climate change for Northern Ireland on species targeted by commercial fisheries (average individual change was to increase 0.42 points in understanding on 1-5 scale, $p<0.05$), but not on aquaculture potential or species and habitats of conservation value.

The average perceived understanding of the group also improved after the workshop, compared to before the workshop, in terms of the likely impact of climate change on the following sectors: oil and gas, renewables, transport, recreation, tourism, marine conservation, aquaculture, and fisheries. We see no change in the average perceived understanding of the group of the likely impact of climate change on the shipping sector. Statistical analysis reveals that the average per-person change in self-estimation of understanding was not statistically significant for fishing, aquaculture, marine conservation, tourism, recreation, transport, shipping, renewables, or oil and gas.

The average pre- and post-session ratings of the four considerations relevant to marine planning climate change scenarios - environmental enhancement, economic viability, and social acceptability - increased. Further, the average range of ratings, which stretched from 73 to 80 (7 points) before the session, became more dramatic (greater in range), stretching from 79 to 91 (12 points) after the session. Statistical analysis reveals that the average per-person change in perceptions of importance was not statistically significant for the four considerations.

The average group concern about the future of each sector increased after the workshop, compared to before the workshop, in all 3 sectors of key interest to MSPACE with no statistically significant change in per-person concern about the future of any of the three sectors.

Overall, the outcome is constructive with engaged and interested participants ready to participate in future information sessions and facilitate the next steps of the MSPACE project.